

**SOLUTION
SCIENCE**

1. (4)
2. (3)
3. (4)
4. (3)
5. (3)
6. (3)
7. (1)
8. (1)
9. (2)
10. (3)
11. (1)
12. (3)
13. (2)

The power of the combination is $\frac{1}{0.3}$ dioptre. The concave lens has therefore smaller power and since the ratio of magnitudes of powers is 2 : 3.

So, we can write $-2k + 3k = \frac{1}{0.3}$

Where k is the constant of proportionality.

Therefore, the powers of the concave and convex

lenses are respectively $-\left(\frac{2}{0.3}\right)$ and $\left(\frac{3}{0.3}\right)$

The focal lengths are $-\left(\frac{0.3}{2}\right)$ m and $\left(\frac{0.3}{3}\right)$ m

or the focal lengths are -15 cm and 10 cm.

14. (3)

Power, $P = \frac{V^2}{R}$ or $R = \frac{V^2}{P}$

Let R_1 and R_2 be the resistances of 25W and 60 W bulbs respectively.

For the same voltage, $\frac{R_1}{R_2} = \frac{P_2}{P_1}$

As $P_2 > P_1$

$\therefore R_1 > R_2$

So, resistance of 25W bulb B is more than 60 W bulb.

As $R = \rho \frac{\ell}{A}$

Since, both the resistances are of same material and of the same length.

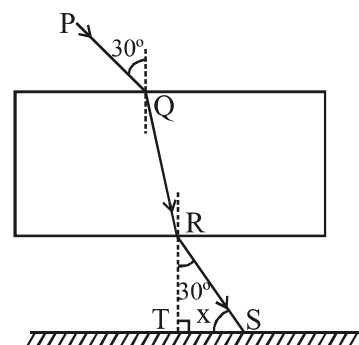
$\therefore \frac{R_1}{R_2} = \frac{A_2}{A_1}$

$\Rightarrow A_2 > A_1$

Hence, 60W bulb has thicker filament.

15. (2)

16. (2)



As, angle of incidence is equal to angle of emergence in case of refraction of light through rectangular glass slab.

From ΔRTS

$30^\circ + 90^\circ + x = 180^\circ$

$x = 60^\circ$

17. (4)

18. (1)

19. (1)

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20. (3)

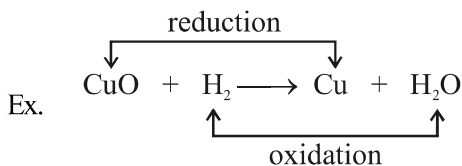
A current carrying wire produces a magnetic field around it. When placed in a magnetic field, the two magnetic fields interact with each other and the wire moves.

21. Oxidation - The addition of oxygen to a substance is called oxidation.

The removal of hydrogen from a substance is called oxidation

Reduction - The addition of hydrogen to a substance is called reduction.

The removal of oxygen from a substance is called reduction.



OR

The various characteristics of chemical reactions are

- (i) Change in state.
- (ii) Change in colour.
- (iii) Change in temperature.
- (iv) Evolution of gas.
- (v) Formation of a precipitate.

22. (a): blood vessels are tubes that transport blood throughout the body, there are three kinds of blood vessels in human body; arteries, veins and capillaries.

(b) Blood platelets are irregular disc shaped cytoplasmic fragments that assist in formation of blood clot at the site of injury and prevent excessive loss of blood.

(c) Lymph is a mobile connective tissue and acts as 'middle man'. It takes part in nutritive process as it carries protein molecules from tissue into the blood stream. It also helps in removing waste products like fragments of dead cells, germs, etc.

(d) Human heart is a muscular organ that pumps blood throughout the body via the circulatory system, supplying oxygen and nutrients to the tissues and removing carbon dioxide and other wastes from the same

23. Nastic movements are non-directional induced variation movements that occur due to turgor changes, these are induced by external stimuli such as light, temperature, touch, etc. For example, if we touch the leaves of *Mimosa pudica* we find that its leaves immediately fold up and droop, it occurs due to turgor changes in cells of plant. Tropic movements are directional movements that occur in response to external stimuli such as light, force of gravity, etc. stimuli cause differential growth in specific plant part via action of phytohormones. For example, roots of a plant grow downward in the soil in the direction of gravity showing positive geotropism.

24. Glomerular filtrate present in Bowman's capsule contains glucose, is filtrate when enters proximal convoluted tubule of kidney then, much of it is reabsorbed back here (65%). Glucose is almost completely reabsorbed in the kidney tubule and is not excreted out.

25. (a) For the near sighted person the power of the lens used for distant viewing is 3.5 m.

∴ Focal length of the distant viewing part of the lens

$$\begin{aligned}
 &= \frac{1}{\text{Power}} = \frac{1}{-3.5} = \frac{1}{-3.5 \text{ m}^{-1}} \\
 &= -0.29 \text{ m}
 \end{aligned}$$

(b) Since the near viewing section of the lens is corrected by 0.5 D.

Power of the near viewing section of the lens

$$\begin{aligned}
 &= -3.5 \text{ D} + 0.5 \text{ D} = -3 \text{ D} \\
 \therefore \text{ Focal length of the near viewing section of the lens} \\
 &\Rightarrow \frac{1}{-3.0 \text{ D}} = \frac{-1}{3 \text{ m}^{-1}} = -0.33 \text{ m} \\
 &= -33 \text{ cm}
 \end{aligned}$$

OR

(a) As here far point is 5m while for normal eye it is ∞.

$u = -\infty$ and $v = -5 \text{ m}$

So,

$$\frac{1}{-5} - \frac{1}{-\infty} = \frac{1}{f} = P$$

i.e., $P = -0.2 \text{ D}$

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- (b) If the object is at a distance of 2m

$$\frac{1}{v} + \frac{1}{2} = \frac{1}{-5} \quad \Rightarrow \quad \frac{1}{v} = \frac{1}{-5} - \frac{1}{2}$$

$$\Rightarrow v = \frac{10}{7} = 1.43 \text{ m}$$

i.e., the virtual image of object which is at 2 m will be formed at a distance of 1.43 m from the lens on the same side.

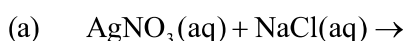
26. Government of India is imposing a ban on the use of polythene bags because these are non-biodegradable substances which are not acted upon by the microbes. So, they cannot be decomposed and therefore persist in the Environment for a long time thereby causing harm to the ecosystem. Polybags choke drains which results in water logging, that allows breeding of mosquitoes and hence leads to various diseases like malaria, dengue, etc. Jute bags and cloth bags are the alternatives to the polythene bags.

27. **Homologous series** - The group of organic compounds having similar structures and similar chemical properties in which the consecutive members differ by $-\text{CH}_2$ group.

Characteristics of homologous series -

- All the members of a homologous series can be represented by the same general formula.
- Any two consecutive members of a same homologous series differ by $-\text{CH}_2$ group.
- The difference in the molecular masses of any two consecutive members is 14u.
- All the compounds of a homologous series show similar chemical properties.
- The members of a homologous series show gradual change in their physical properties with increase in molecular mass.

28. A white precipitate of silver chloride is formed alongwith sodium nitrate solution.



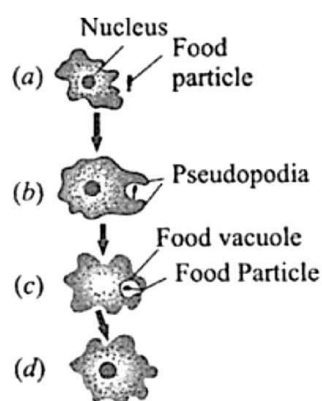
- (b) Precipitation reaction.

29. (a) The breathing cycle involves inhalation and exhalation of air due to alternate expansion and contraction of thoracic cavity. Thus it is a rhythmic process. But exchange of gases is a continuous process as it takes place between the blood and each and every cell, by diffusion.

- (b) Leakage in the conducting tubes circulatory system would lead to a loss of pressure which would reduce the efficiency of the pumping system. So, there would be decrease in blood pressure and decrease in efficiency of circulation. Prevention:

- After a leak the number of platelets would get increased that minimise the leakage by clotting of blood.
- The blood clots if conducting tubes of a circulatory system develops a leak.
- The platelets will increase, which will minimise the leakage.
- Due to this, the inactive thrombin will become the active one in the presence of thromboplastin.
- Moreover, this active thrombin will convert the inactive fibrinogen into the active fibrin and it results with a clot.
- The problem is that if the person doesn't develop with a blood clot, then the medical care is required, otherwise this can lead to death.

OR



Nutrition in an Amoeba occurs through a process called phagocytosis where the entire organism pretty much engulfs the food it plans on eating up. The mode of nutrition in amoeba is known as holozoic nutrition. It involves the ingestion, digestion and egestion of

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food material. Holozoic nutrition in amoeba takes place in the following steps:

- Ingestion
- Digestion
- Absorption
- Assimilation
- Egestion

Process of nutrition in Amoeba

The different processes involved in holozoic nutrition in amoeba are:

Ingestion : Ingestion is the process of taking in the food into the body either by swallowing or absorbing it. Amoeba pushes out the pseudopodia to encircle the food and engulfs it forming a food vacuole. This process is known as phagocytosis.

Digestion : Digestion is the process of breaking the insoluble and large food molecules into soluble and minute molecules. In amoeba, the food vacuoles are transported deeper into the cell and with the help of the digestive enzymes, the large insoluble particles are broken down to the simplest molecules.

Absorption : In this process of absorption, the nutrients from the digested food material are absorbed into the cell's cytoplasm by leaving behind the undigested particles. This process is called diffusion. The excess food is stored in the form of glycogen and lipids.

Assimilation : Assimilation is the process of obtaining energy from the absorbed food molecules. In amoeba, absorbed food molecules are utilized for producing the energy required to carry out different life processes within the cell.

Egestion : Egestion is the process of excretion of undigested food material. In amoeba, this process is carried out by rupturing the cell membrane to remove the undigested food material from its body.

30. (i) The direction of magnetic field produced around a current carrying conductor is given by right hand thumb rule. If the conductor carrying current is held in the right hand in such a way that the thumb points in the direction of current, then direction of curl of fingers gives the direction of the magnetic field.
- (ii) The direction of force experienced by a straight conductor carrying current placed in a magnetic field,

which is perpendicular to it determined by Flemings left hand rule. Hold the thumb and the first two fingers of the left hand at right angles to each other with the first finger pointing in the direction of the field and the second finger in the direction of the current, then the thumb points the direction of the motion.

- (iii) Clock rule (loop rule or end rule)- If a current round any face of the coil is in anti clockwise direction, it behaves like north pole. If the current flows in the clockwise direction it behaves like South pole.

31. Power = 4 kW

$$\text{Voltage} = V = 220 \text{ V}$$

$$\text{Time, } t = 2 \text{ hr}$$

$$(a) \text{ Current, } I = \frac{P}{V} = \frac{4000 \text{ W}}{220 \text{ V}} = 18.2 \text{ A}$$

$$(b) \text{ Resistance, } = \frac{220 \text{ V}}{18.2 \text{ A}} = 12.1 \Omega$$

$$(c) \text{ Cost} = 8 \text{ kWh} \times 0.50 / \text{kWh} = \text{Rs. } 4/-$$

32. Given, convex lens

$$(a) h_0 = 4 \text{ cm, } u = -20 \text{ cm, } f = 16 \text{ cm}$$

$$\text{Using, } \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \left(\frac{1}{v} = \frac{1}{f} + \frac{1}{u} \right) \Rightarrow \frac{1}{v} = \frac{1}{16} + \frac{1}{-20}$$

$$v = 80 \text{ cm}$$

$$(b) m = \frac{v}{u} = \frac{80}{-20} = -4$$

$$\frac{h_i}{h_0} = -4$$

The height of image is magnified 4 times that of object.

- (c) The image is real and inverted.

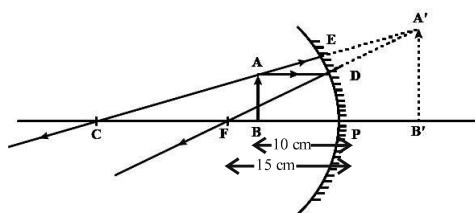
OR

(i) Behind the mirror

(ii) Magnified

(iii) Virtual and erect

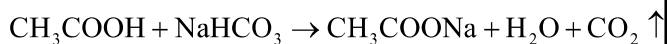
Labelled ray diagram



33. (a) The ozone layer is very important for the existence of life on Earth because it forms a protective shield around Earth by absorbing most of the harmful ultraviolet (UV) radiations coming from the Sun and prevents them from reaching the Earth. The UV radiations have extremely harmful effects on human beings, animals and plants as well, i.e., cause mutations, skin cancer, cataract, damage immune system, etc. So, ozone layer must be protected to save the environment.

(b) 1. The two ways which can help in protection of ozone layer and environment are : (i) the use of chemicals like chlorofluorocarbons (CFCs) which are widely used in refrigerators and air conditioners (as a coolant), in re extinguishers and in aerosol sprayers destroy the ozone layer gradually. We can protect our ozone layer by avoiding the use of such objects and chemicals which are releasing CFCs etc. 2. Nitrous oxide is the largest ozone depleting substance as well as greenhouse gas released by human activities, such as from motor vehicles, fertilisers etc. People should be encouraged to use more public transport using hybrid or electric cars and use of fertiliser formulations to reduce emission of nitrous oxide.

34. (a) Salt X is sodium acetate (CH_3COONa)
Gas Y is carbon dioxide.



(b) (i) Ethanoic acid is used to coagulate rubber from latex.
(ii) Ethanoic acid is used in the preparation of dyes, plastics and pharmaceuticals.

OR

X is ethanol.
Y is ethanoic acid.

Z is ethyl ethanoate.

35. (a) (i) The ovaries in female are primary sex organs (or female gonads) which perform the dual function - production of female gametes (eggs or ova) and secretion of female sex hormones (estrogen and progesterone).
- (ii) Oviducts or Fallopian tube are paired tubes originating near to the ovaries of their respective sides and extend upto uterus, the terminal part of Fallopian tube is funnel-shaped with finger like projections called fimbriae lying near ovary. Fimbriae pick up the ovum released from ovary and push it into Fallopian tube. Fertilisation also takes place in the oviduct.
- (iii) Uterus is a single, pear-shaped, highly muscular, hollow structure present in the pelvic cavity, lying between urinary bladder and rectum. If fertilisation takes place, the embryo gets implanted to the wall of uterus and grows there until birth. Development of foetus occurs inside uterus, hence it is also called womb.
- (b) Placenta is an intimate connection between fetus and uterine wall of the mother to exchange the materials. It is a disc shaped structure embedded in the uterine wall. It contains villi on embryo's side and blood spaces towards mother's side. Blood spaces surround villi. Placenta performs the following functions : (i) All nutritive elements from maternal blood pass into the fetus through it. (ii) Placental helps in respiration i.e., supply of oxygen and removal of CO_2 from fetus to maternal blood.
(iii) Fetal excretory products diffuse out into maternal blood through placenta and are excreted by mother.
(iv) Placenta also secretes hormone.

OR

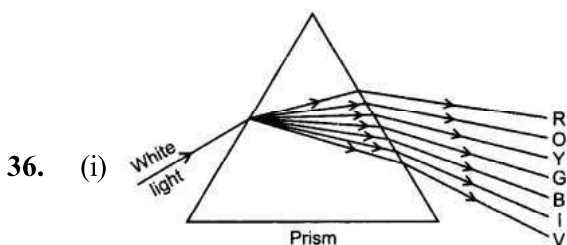
- (a) In the given diagram A is stigma, B is pollen tube, C is ovary and D is female germ cell.
- (b) The process of transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower is known as pollination. Pollination is important because it brings pollen grains to the female reproductive part (carpel) of the plant that leads to fertilisation.

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(c) Fertilisation, in plants, occurs when the male gamete present in pollen grain fuses with the female gamete (or egg) present in ovule. When a pollen grain falls on the stigma of the carpel, it bursts open and grows a pollen tube downwards through the style towards the female gamete in the ovary.

Male gametes move down the pollen tube, pollen tube enters the ovule in the ovary, the tip of pollen tube bursts and male gametes comes out of pollen tube. In ovary, the male gamete of pollen combines with the female gamete or egg present in ovule to form a fertilised egg. After fertilisation,

- (i) ovule develops into seed
- (ii) ovary develops into fruit



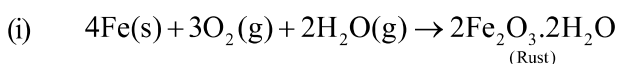
(ii) Red light has the maximum wavelength and violet light has the minimum wavelength, so in any medium, red light bends least while violet light bends the most

As, $\text{wavelength} \propto \frac{1}{\text{deviation (or bending)}}$

(iii) Light rays of different colours travel with the same speed in vacuum and air. But in any other medium, they travel with the different speeds, and bend through the different angles, which leads to the dispersion of light.

37. (i) $4Al + 3O_2 \xrightarrow{\text{Air}} 2Al_2O_3$
- (ii) $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$
- $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$
- (iii) Sodium oxide (Na_2O) and potassium oxide (K_2O)
- (iv) $Na_2O(s) + H_2O(l) \rightarrow 2NaOH(aq)$

OR



- (ii) Painting and oiling, anodising, making alloys.
- (iii) It is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.
- (iv) The alloy which contains mercury as one of the metal is called amalgam.

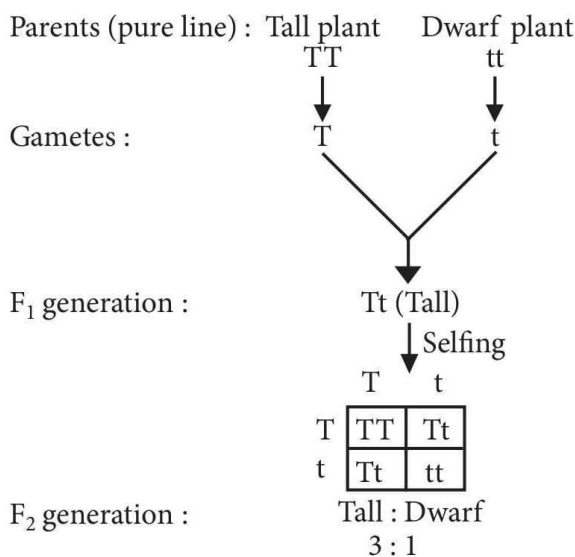
38. a. Mendel choose pea plants for his experiments because of the following reasons:

- (i) The flowers of this plant are bisexual.
- (ii) They are self-pollinating, and thus, self and cross-pollination can easily be performed.
- (iii) The different physical characteristics were easy to recognize and study.
- (iv) They have a shorter life span and are the plants that are easier to maintain.

- (b) Pod color- green Stem place- Axial
- (c) The genotype of both X and Y flower contains the dominating allele 'B' and a dominant allele always exhibits its traits even in the presence of recessive allele "b".

OR

Mendel first selected two pure line plants. He then crossed such plants having contrasting characters. In the F₁ generation, he observed that only one of the two contrasting character appeared, he called it dominant and the one which does not get expressed in F₁ was recessive. He later selfed the F₁ plants and observed that both the traits appear but in a definite proportion. It can be explained by the following cross:



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This is how Mendel explained that a trait may be inherited but not expressed in the plant

39. (i) $R = 1 \Omega \text{cm}^{-1}$

$R_2 = R_3 = R_5 = 10\Omega$

From the figure, the effective resistance between B and D is

$$\frac{1}{R_{BD}} = \frac{1}{R_5} + \frac{1}{R_2 + R_3}$$

$$\Rightarrow \frac{3}{20} \Rightarrow R_{BD} = \frac{20}{3} \Omega$$

(ii) $R_1 = R_2 = R_3 = R_4 = R_5 = 10\Omega$

$R_{AE} = R_1 + R_{BD} + R_4$

$$= 10 + \frac{20}{3} + 10 = \frac{80}{3} \Omega$$

(iii) **Step 1 : Equivalent resistance**

Let n be the number of resistors to be connected in parallel

Then, $R_1 = R_2 = \dots = R_n = R = 176 \Omega$

Now, $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$

$$\Rightarrow \frac{1}{R_{eq}} = \frac{n}{R} = \frac{n}{176}$$

$$\Rightarrow R_{eq} = 176/n \quad \dots(1)$$

Step 2 : Applying Ohm's law

$V = IR_{eq}$

$$\Rightarrow 220 = 5R_{eq}$$

$$\Rightarrow 220 = 5 \times 176/n \text{ (Using Equation (1))}$$

$$\Rightarrow n = 4$$

Hence, four resistors are required.

OR

(iii) Here, $I = 80\mu\text{A} = 80 \times 10^{-6} \text{ A} = 8 \times 10^{-5} \text{ A}$

$t = 1 \text{ sec}$

By, $I = \frac{q}{t} = \frac{ne}{t}$, we get $n = \frac{It}{e} = \frac{8 \times 10^{-5} \times 1}{1.6 \times 10^{-19}}$

$\Rightarrow n = 5 \times 10^{14}$ electrons strike the screen every second.

$$I = \frac{q}{t} \Rightarrow q = It = 8 \times 10^{-5} \times 2 \text{ min}$$

$$= 8 \times 10^{-5} \times 2 \times 60$$

$$= 960 \times 10^{-5} = 9600 \times 10^{-6} \text{ C}$$